

**Reading One**

**PRELIMINARY STUDY OF THREE POLYNESIAN SOURCES  
FOR CELESTIAL NAVIGATION**

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Factors which made possible the marvelous maritime exploits of the ancient Polynesians were: first, their skill in building staunch and seaworthy vessels; second, intensive study and cumulative knowledge disseminated in their schools concerning weather observation, winds, tides, ocean currents, geography, and astronomy; third, superb seamanship; and finally an unwavering faith in their gods.

(Makemson 1941:32)

This is a study of what three native Hawaiian scholars say about celestial navigation. Makemson claims, in the passage above, that the marvelous ancient Polynesian maritime exploits were made possible because of skill, knowledge, and seamanship. The main problem considered in this paper is whether or not much is really known about Hawaiian navigational knowledge.

Few would disagree that deliberate canoe voyages to Hawaii from Central Polynesia were considered marvelous exploits, however some would prefer to describe them as "accidental" (Sharp 1956:149) and others discredit Polynesian navigational knowledge. Åkerblom concludes that "Polynesians...accomplished their voyages, not thanks to, but in spite of their navigational methods" (1968:156 my emphasis). Similarly, Snow does not accept the idea of Polynesian navigational expertise because as he states,

There is widespread and often uncritically accepted tradition that these people were expert navigators, but this is impossible because accurate navigation requires accurate measurements and precise timekeeping.

(Snow 1970:11)

The problem of how much Hawaiians knew about navigation might well be explored by an examination of early documents written by

native Hawaiians. All Hawaiian sources I studied postdate European influence (1778) by 60 to 80 years, and although they vary in focus and the amount of information presented, the sources appear generally consistent. I think that this study will demonstrate that information on Hawaiian celestial navigation currently available represents a scant fragment of the original storehouse of data which must have been essential for inter-island Hawaiian and open-ocean Pacific voyaging.

The three primary sources investigated for information about Hawaiian navigation were:

- 1) The 1971 edition of David Malo's Hawaiian Antiquities which was written in the 1840's (Barrère/Personal Communication) and was first published in 1903.
- 2) Samuel Kamakau's Instructions in Ancient Hawaiian Astronomy as Taught by Kaneakahoowaha, one of the Counsellors of Kamehameha I was published originally in the Hawaiian newspaper Ka Nūpepa Kūōko'a in 1865.<sup>1</sup> The English translation by W. D. Alexander<sup>2</sup> was published 26 years later in Thomas G. Thrum's 1891 Hawaiian Annual.
- 3) The 1971 edition of Kepelino's Traditions of Hawaii was written about 1868 (Barrère/Personal Communication) and first published in 1932.

In addition to these sources by native authors, a missionary volume, History of the Sandwich Islands, published in 1843 by the Rev. Sheldon Dibble was searched for information.

Among contemporary sources surveyed were Rodman (1927), Åkerblom (1968), Makemson (1938, 1939, 1941) and Lewis (1964, 1973).

It is worth noting that a thorough study of this subject should be undertaken only after one is knowledgeable in both astronomy and navigation; unfortunately, I lack a background in both. My study was further restricted by my limited ability to understand Hawaiian.

Translation of newspaper documents is beyond my current level of proficiency. Moreover, understanding the vision of the universe that Hawaiians had while working from the brief descriptions (Taylor 1965) available is not as simple as I had hoped. Thus the current report is only an account of what I found in about six weeks of sporadic search and in no way represents a definitive study.

The scope of this paper includes consideration of both primary and secondary sources mentioned above. In approaching these problems it is worth noting that navigation in Hawaii, as elsewhere in Polynesia, was traditionally subject to systems of belief and secret teaching (Snow 1970:11; Gladwin 1970:19-20; Lewis 1973:17). Most of the old systems in Polynesia have been lost. However, the work of Gladwin (1970) and Lewis (1973) has recorded and revived traditional techniques in Micronesia.

The many other techniques for navigating, besides astronomy, were not included in this study. Among these were determination of currents and swell, "sea marks" (Lewis 1964:365; 1973:249; Gladwin 1970:162-164), bird flight patterns (Weckler 1943:17-18), volcanic signs,<sup>3</sup> scents, clouds, island reflections, and flotsam and jetsam patterns (Makemson 1941:4; Weckler 1943:17; Sharp 1963:392).

Their exclusion is not meant to imply that any of these techniques were less important or necessary than using astronomical aids in voyaging, and it is important to stress that navigators combined all techniques and used them with sound judgement.

When one examines the primary sources on Hawaiian astronomy the problem of reliability of sources is immediately apparent. The

manuscripts have often been processed through many hands. There may be inscribers, transcribers, translators and advisors. These people may have special biases which influence their choice of words. It is also highly likely that they may not have had a background in celestial navigation which qualifies them to deal with the subject.

Native Hawaiian scholars may have been influenced by American and European concepts. According to Dorothy Barrère (Personal Communication), Malo and Kamakau relied heavily on Hoapili for their astronomical information. Sahlins' article quotes William Richards as saying in 1841 "The late Hoapili...was accounted one of their most skillful astrologers." (Sahlins 1973:30). I am assuming in this context that astronomer and astrologer were synonymous. But one should be especially cautious of sources published after the informant, Hoapili, died.

I attempted to examine the first astronomy and geography textbooks which were published at Lahainaluna Seminary Press to see if they provided a clue to the exposure Malo and Kamakau may have had in these subjects. Astronomy: that is, an explanation of the nature of the sun, the earth and the stars (Clark 1837; Dibble 1909:417) came out in 1837. It may be the volume referred to by William Richards:

The first little book which was published containing some of the true principles of astronomy awakened their surprise, and they at once brought forth the common vulgar objections to it.

(Sahlins 1973:32)

A clue that the book referred to above must not have been the one I located comes in the subsequent passage that implies that

Hoapili examined the figure of the earth and was persuaded that the earth is round, for Hoapili said:

When I have been far out at sea on fishing excursions (sic), I always first lost sight of the beach—then the houses and trees—then the low mountains and last of all the high ones. So when I returned, I first saw the high mountains, then the lower ones, then the trees and houses, and last of all the beach. I think the foreigners are right, and that the earth is round.

(Sahlins 1973:32)

But the astronomy book I located had no pictures. Geography books were illustrated; but a further search of astronomy texts needs to be made. A similar version of this story appears in Dibble (1843:110).

It is also worth mentioning in passing that the astronomy text reads more like the Old Testament creation stories in Genesis than like a science text of today. The fact that Lahainaluna was a Seminary to train Christian preachers is significant.

The story quoted above by Sahlins implies that Hawaiians were willing to shift their view of the world in accordance with the new information.

In shifting from early textbooks to the men for whom they were written, let us look at the works of David Malo, Samuel Kamakau and Kepelino. David Malo was born about 1793, fifteen years after the arrival of Captain Cook and died in 1853 at about the age of sixty. His life spanned from the arrival of the missionaries to the heyday of the whaling period. He lived in Lahaina, and later had two churches where he was the preacher; one in Kalepolepo (near Kihei) and the other in Keokea, (Kula) Maui.

In 1831, when Lahainaluna was founded, he was one of the first pupils to enter; at that time he was thirty-eight years old. He worked for Sheldon Dibble collecting history and folklore and is supposed to be one of the main contributors to History of the Sandwich Islands (1843). Perhaps Malo supplied the information about Hoapili which appears identically in both Dibble (1843:110) and Richards (Sahlins 1973:32)

But what can be found about celestial navigation in Malo's writings? One of his books, a Life of Kamehameha I (Malo 1971:xviii) was lost. His Hawaiian Antiquities (1971) contains virtually nothing about the subject. A chapter on the compass (p. 9-12) and "Terms used to designate space above and below" (p. 12-16) give some sense of the Hawaiian conception of the universe, and "The Hawaiian canoe" (p.126-135) provides names of parts and some chants; but I could find nothing in Malo on navigation.

Edwin H. Bryan, Jr., Director of the Pacific Scientific Information Center at the Bishop Museum and former teacher of astronomy at the University of Hawaii, has indicated (Personal Communication) to me that Malo never gives any specific data on anything of a scientific nature.

Thus, I have dismissed Malo in my search for information from natives on Hawaiian celestial navigation. The next author considered was Samuel Manaiakalani Kamakau (1815-1876) who, according to Rubellite Johnson (Personal Communication) of the University of Hawaii, is the best native source on the subject of navigation. Others have also praised Kamakau. Edwin H. Bryan pointed out that while Kamakau doesn't say much about technical astronomy, he may have known some-

thing about navigation.

Kamakau was well qualified as an historian. Thomas Thrum, reflecting the feeling that prevailed both during Kamakau's life and after he died, praises the latter's knowledge of both history and traditions. He quotes an Advertiser editorial of March 31, 1866:

In ancient traditional knowledge of the Hawaiians  
the late David Malo alone excelled him. (Kamakau)  
(Thrum 1918:48)

Thrum also quotes Judge Abraham Fornander as saying that "Probably the best informed Hawaiian archaeologist of the present day is S. M. Kamakau, but even he is often very credulous, inconsistent and uncritical" (Thrum 1918:45). Another more favorable appraisal was made by Thrum himself:

As a (sic) historian and legendary writer he stood peerless and alone among the present sons of Hawaii. He was a man who might well be called a representative Hawaiian. There are but few today who present as he did the characteristics of Hawaiians, unhurt by the various influences of civilization. As a thinker and reasoner, he was thoroughly original; he looked at questions of the day from a position so peculiar as to be accountable for them only on the theory of his inbred Hawaiianism. His memory was remarkably accurate and acute...

(Thrum 1918:52)

What was the background of one so highly praised as Kamakau? He was born in Mokuleia, Waialua, Oahu, in 1815 and at the age of 18, in 1833, enrolled at Lahainaluna where he was one of a class of 24 students. He stayed there seven years as a pupil and teacher's assistant, starting his research on historic writing in 1836 and continuing until 1848 (Thrum 1918:45). After this time he



became a member of an association whose purpose was the "conservation of historical data" (Thrum 1918:41). Thrum says this historical society, formed in 1841, was set up to study the

...origin of this race and to obliterate the common belief among some foreigners who claim that this is a wandering race which was lost in a storm and driven by the winds to these shores.

(Thrum 1918:41)

In the course of this historical work, Kamakau "materially aided" (Thrum 1918:40) Fornander both in the compilation of the Collection of Folklore and Polynesian Race. These documents were not used in this present study because of the shortness of time and their emphasis on traditional lore which is outside the scope of this study.

After his time at Lahainaluna, and until his death (1876) in about his sixtieth year, Kamakau published in newspapers. In one of these articles we find the most important document on Hawaiian astronomy, Instructions in Ancient Hawaiian Astronomy as taught by Kaneakahoowaha, one of the Counsellors of Kamehameha I. This work is available both in original newspapers (Ka Nūpepa Kū'oko'a August 5, 1865) and in an English translation by W. D. Alexander published by Thrum in 1891 (Hawaiian Annual 1891:142-43).

This article begins by describing a gourd which illustrates and vividly conceptualizes astronomical ideas. The ideas postdate European influence (Cook - 1778) by 87 years and missionary influence (1820) by 45 years. Kamakau describes a gourd on which lines are drawn to represent the highways of the navigation stars, outside

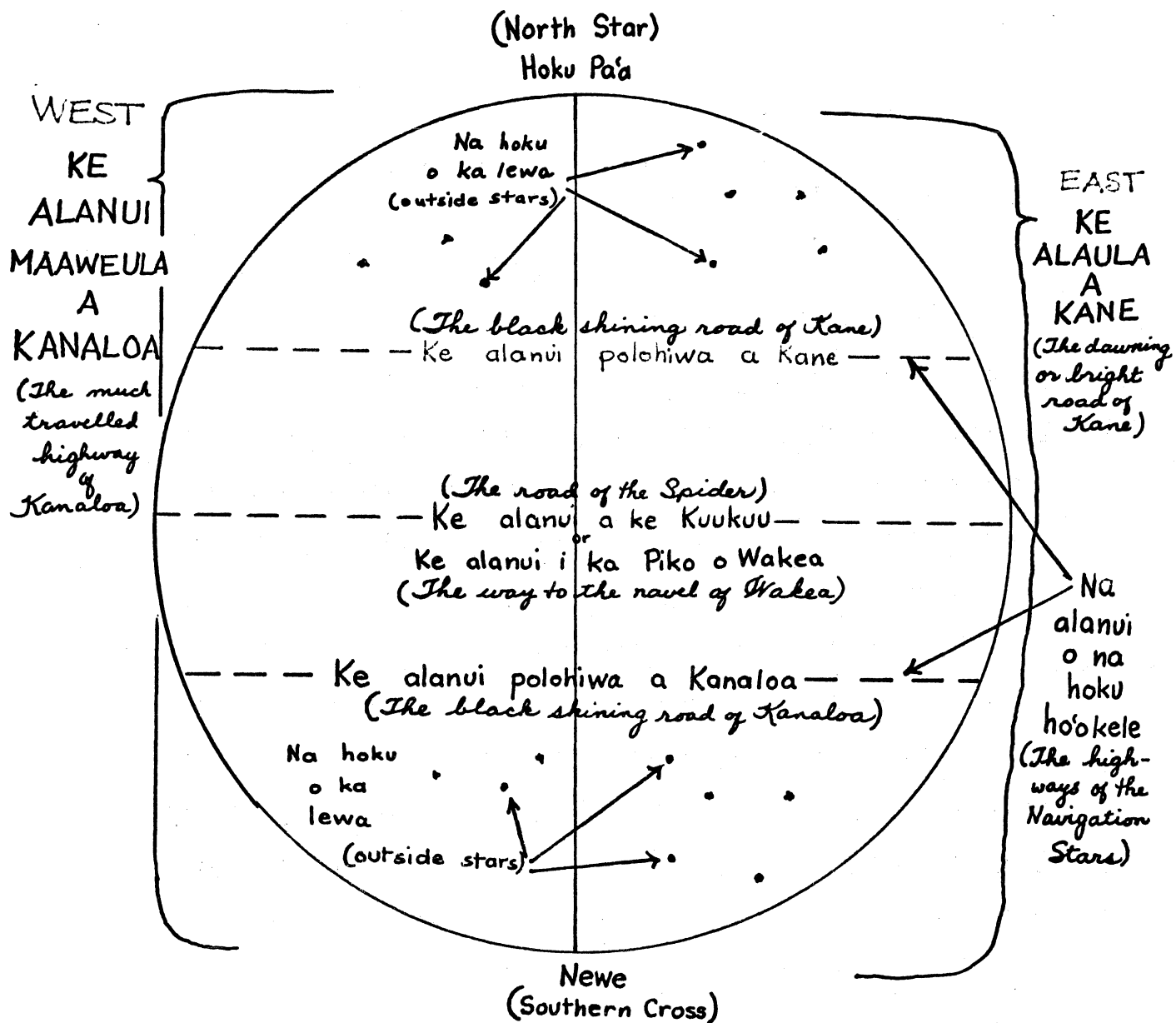


DIAGRAM OF GOURD  
DESCRIBED BY KAMAKAU (1865:142)

Figure 1

stars, the north star and the southern cross. Two lines define the parameters of the apparent motion of the sun from north to south and a third marks "the way to the navel of Wakea" which marks the celestial equator or the position of the sun during the equinoxes (Kamakau 1891:142). (See Figure 1)

There is no way to verify whether these concepts are based on European ideas and simply assigned Hawaiian names, or whether the Hawaiians had these concepts as part of their astronomical knowledge. Mr. Bryan of the Bishop Museum suspects that the Hawaiians were well aware of the limits of the sun's variability in moving from north to south and, I might add, the midpoint of the sun's path may have been determined to help establish the variability on either side.

The purpose of calling stars beyond these north and south limits "outside stars" (Nā Hōkū o ka lewa) is not clear with regard to how they relate to navigation. Moreover, why these north and south limits of the sun's movement are labelled the "highways of the navigation stars" (Nā alanui o nā hoku ho'okele) is also not clear.

The information on horizon stars and zenith stars that I was hoping and expecting to find is nowhere present in this article. Clues about how to use swell, birds, currents, and other presumably necessary navigational aids are not included either. By the absence of these details one must conclude that only a scant fragment of the knowledge necessary to navigate in Hawaiian waters or over the Pacific remained in the time of Kamakau.

The reason this may be so is related to the fact that the

Hawaiians had given up voyaging to the south about 500 years before Kamakau's time. It is not hard to conceive how easily the ideas might be lost since navigation was a skill which required constant practice and the knowledge about it was conveyed only to a few people.

In concluding this section on Kamakau, it is worth noting that he made a deliberate attempt to relate the Hawaiian concepts to the new ideas which the missionaries introduced. In fact, in his book, The Works of the People of Old (Na Hana a ka Po'e Kahiko) (In Press), after a discussion of the Hawaiian concepts of horizons, he says

We of today can compare these terms with those  
used now and see how much alike they are.

(Kamakau In Press:6)

Thus his tendency to see likenesses might have heavily skewed the information Kamakau was reporting on.

When one moves to Kepelino, one is faced with problems that are similar to the problem of searching for information in Malo's works. Kepelino does deal with related subjects: calendar (1971:84-97), seasons (1971:82-85), and star lore (1971:78-83). But the latter subject is treated with the greatest brevity.

But before looking at the information he offers, Kepelino's background needs to be examined. He was also known as "Kahoali'-ikumaiwakamoku" ("To be the chief of the nine districts"), "Kepelino Keauokalani", "Zepherine", and "Zeperino". He was born on the island of Hawaii around 1830 and died about 45 or 50 years later in about 1878 (Kepelino 1971:4-5). His birthdate postdates by about a decade

the arrival (1820) of Calvinist missionaries from Boston. His parents were among the earliest converts to the Catholic mission which was established in Kailua, Kona, in 1840<sup>4</sup> when Kepelino was about 10 years old.

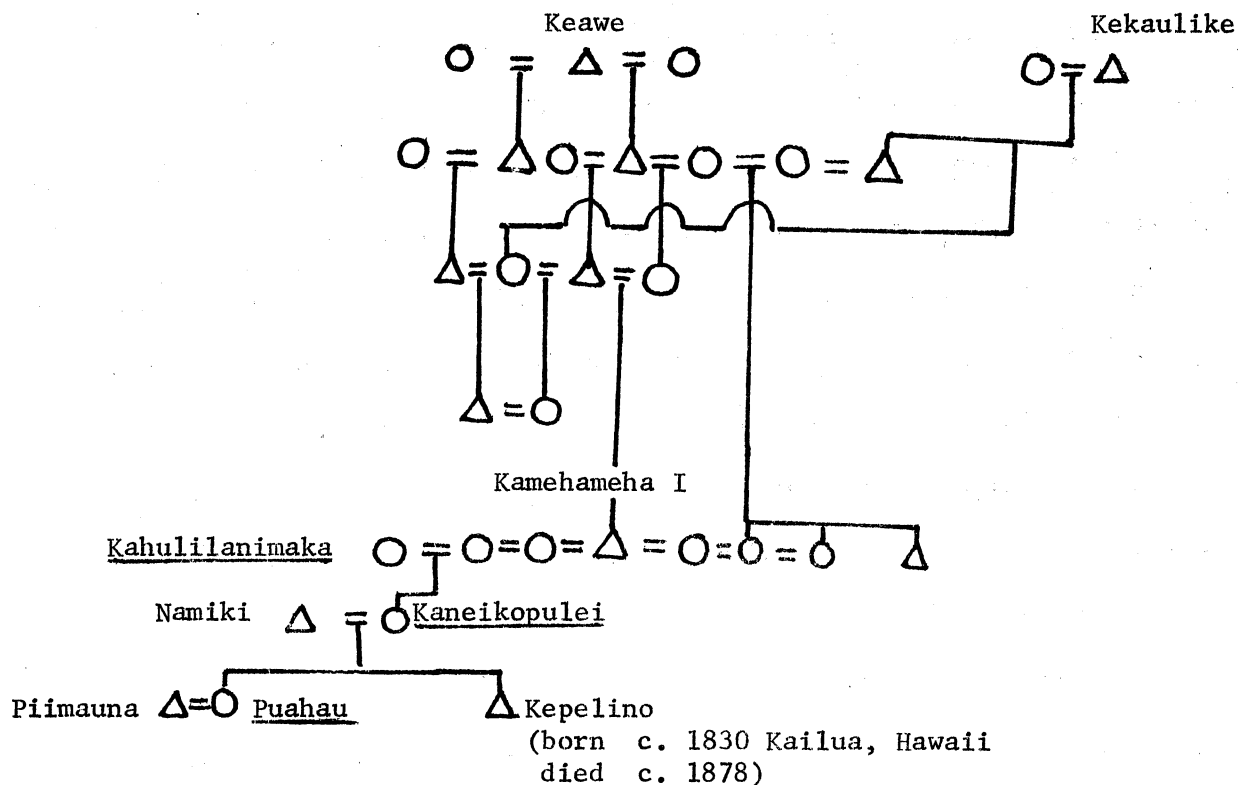
What education and background did Kepelino have that might qualify him as a native source of celestial navigational knowledge? He did not attend Lahainaluna Seminary as Malo and Kamakau did. Rather, he studied English, French, Latin and Greek with Bishop Maigret at the Catholic High School at Ahuimanu. I have found no direct or indirect evidence concerning the kinds of books used by the Catholics in their education of Hawaiians. However, since the purpose of this education was primarily for religious conversion and teacher training, one might assume that scientific knowledge played a minor role in the total curriculum.

If he did not learn much about navigation from books, in what other ways might Kepelino have learned? It is worth noting that he had the opportunity to sail to Tahiti in 1847 on a voyage of 31 days (Beckwith In Kepelino 1971:4). But one would presume that the voyage was accomplished by European navigational techniques. What Kepelino would have gained from it would have been general information about the voyaging of his time, and virtually nothing about traditional canoe navigation.

One might also ask in examining Kepelino's credentials as a source of native voyaging information: what might he have learned from his family? In this regard, it is important to note that he traced his paternal ancestors back to Pa'ao (Beckwith In Kepelino:

1971:5) who, according to traditions, sailed from Tahiti to Hawaii a couple of times (Emerson 1893:5; Buck 1964:283; Finney 1967:163; Malo 1971:6) and "may have helped to establish the system of sailing directions for this route" (Bryan 1955:45). Pa'ao was renowned as "a skilled navigator...adept in the astronomical lore of the time" (Emerson 1893:12), but the number of generations intervening between Pa'ao and Kepelino is not known and because Pa'ao is essentially a legendary figure<sup>5</sup>, this is a tenuous link to astronomical knowledge.

Since I was unable to locate the paternal genealogy of Kepelino, I explored his mother's side. (See Figure 2) Kepelino's mother,



\*females underlined

Figure 2

Kaneikopulei, was a daughter of Kamehameha I and Kahulilanimaka. One might assume that this high chiefly line would have access to navigational knowledge, but one can easily question whether such knowledge was being passed on after the introduction of European sailing vessels<sup>6</sup> (1790's) and the intensive missionary effort to convert natives to Christianity (after 1820). The information I had access to stressed his education by a French Catholic priest and made no mention as to whether or not members of his family were passing on their traditions to him. Moreover, I found nothing to indicate that Kepelino was particularly interested in celestial navigation.

In Kepelino's only published work, Traditions of Hawaii, nineteen out of eighty pages (1971:74-113) deal with "Star lore and the calendar." Most of these pages concentrate on the calendar. However, one sentence has been the focus of a discussion by Makemson, Åkerblom (1968:39-40), and Lewis (1973:238). The problem, as Lewis defines it, is whether a zenith star concept is suggested by this sentence:

'Oia nā hoku e kau pakāhi ana maluna iho o kela  
'aina keia 'aina, e like me nā hoku-le'a ma ko  
Hawai'i nei pae-'aina, a me nā hoku-ke'a ma nā  
mokupuni o Tahiti, &. &. (Kepelino 1971:83)

The translations by Beckwith and Elbert demonstrate a difference in that one suggests a horizon star concept (kau = rise) and the other interprets the same word as a possible zenith star concept (kau = suspended over)

## GUIDING STARS

The stars that act as guides  
to land are those that rise  
over each land,  
like the Hoku-Lea that  
rises over the Hawaiian islands  
and the Southern Cross  
over the Tahitian, and so forth

(Beckwith In Kepelino 1971:82)

## PROTECTING STARS

These are the stars that are  
suspended severally  
over the various lands,  
such as Hoku-lea in the  
Hawaiian Islands  
and the Southern Cross  
over the lands of Tahiti, etc.

(Elbert In letter to Finney 1969:n.p.)

After showing the differences between Beckwith's translation (stars "that rise (kau) over each land"; (Beckwith In Kepelino 1971:82) and Makemson's and Elbert's version (stars "that are suspended (kau) severally over the various lands"; (Makemson 1941:13 and Samuel H. Elbert's letter to Ben Finney 11/19/69 cited in Lewis 1973:238), Lewis points out the European influence in Kepelino's use of the term "Tahiti" instead of the traditional Hawaiian term Kahiki, implying the zenith concept is a European interpolation. It may well be, but this raises a problem Lewis does not discuss. Perhaps Kepelino actually means Tahiti in this context, for there is no necessary one-to-one correspondance between Kahiki and Tahiti in the Hawaiian language. Andrews, in his dictionary published originally in 1865, gives the meaning of Kahiki as

The general name of any foreign country

(Andrews (1865) 1974:244)

while Pukui and Elbert, in a more recent dictionary, say it means



Any foreign country, Tahiti

(Pukui and Elbert 1971:104)

Thus, it may be that Kepelino was referring directly to Tahiti, the place he had visited as a youth.

One must conclude that one cannot readily assume that Kepelino's "Guiding Stars" (1971:82-83) section is describing zenith stars.

Åkerblom expresses the currently prevailing view that the concept is part of a putative system, for as he claims

...there is nothing to suggest that the Polynesians did in fact fix their latitude by observing a zenith star.

(Åkerblom 1968:38)

The process of manuscript handling is a particular problem in the case of Kepelino. Apparently he dictated the material to Bishop Maigret, the founder of the Catholic mission, who recorded it, presumably in Hawaiian. (I have not seen the original document.) This manuscript was then typed by Father Reginald Yzendoorn, the Catholic mission's Chancellor-Secretary, in 1931. This typescript was translated by Mary Kawena Pukui and Martha Beckwith with advice from Lahilahi Webb and John Wise. Chants were checked by Mrs. Pukui's mother, Mrs. Wiggin. Then the book was published by the Bishop Museum. Seven people worked over Kepelino's spoken words. How much was lost or added in the handling is a matter for speculation.

In concluding this section on Kepelino, it should be reiterated that his writings are not especially helpful to the study of Hawaiian

astronomical knowledge. While his information on the names of stars and the calendar might be useful to those making comparative studies, they do not add new information to what is offered elsewhere by others.

In conclusion, I would like to return to my original thesis that only a small fragment of Hawaiian astronomical knowledge remains. We do know lists of star and planet names, names of the seasons, months and days. But these are like three darts on a well-used dart board; they are what we see now. The holes that marked where many other darts hit represent the many things that were once there but are now gone. No visible traces remain of Hawaiian astronomical knowledge, because of its very nature as an art based on verbally transmitted knowledge conveyed to very few experts, and because so much of the actual navigation was done on the basis of expert judgement. How could one expect such knowledge to last five centuries with an absence of open ocean voyaging? For when Europeans came to the Hawaiian Islands in 1778, voyaging was limited to inter-island canoe trips. Professor Kyselka, of the University of Hawaii, with whom I agree, points out the limitations of knowledge of Hawaiian navigational methods:

We know little of the ancient methods of navigation. The men that Captain Cook talked with were many generations removed from those who made the long voyages, but they were skilled/in the ways of the sea, and traveled between the islands guided only by the stars.

(Kyselka 1969:n.p.)

## NOTES

1 Ka Nupepa Kū'oko'a, "No ke a'o hoku" Ke kilohana Po'okela no ka Lahui o Hawai'i. Buke IV Helu 31. Honolulu, Augute 5, 1965, Na Helu a pau 192. 4th page.

2 William DeWitt Alexandar (1833-1913).

3 No sound data reflecting distances at which volcanic eruptions and resultant metereological disturbances are visible at sea were found in this study. Furthermore, as far as I know, no one has tried to correlate early archaeological sites with eruptions; thus Makemson's statement:

The original discoverer of the Hawaiian group was undoubtedly aided by seeing the reflection of volcanic fires on the clouds, which must have been visible at night from a great distance.

(Makemson 1941:12)

can only be considered highly speculative.

4 The first Catholic missionaries came to Hawaii on July 8, 1827; the Kona mission was established in the 1840's by French priests of the Congregation of the Most Sacred Hearts of Jesus and Mary. (Monsignor Marzen, Hawaii Catholic Herald, Personal Communication)

5 Dr. Ben R. Finney has pointed out that while the Pa'ao legends (1967:163-164) need not be taken as literal history, it can't be "...ignore (d) that two-way voyaging was a common feature in Hawaiian traditions of the Tahitian contact era." (1967:164)

6 Vancouver left some of his shipwrights to teach the Hawaiians to build their own vessels. In 1794 the first vessel was completed. (Marion A. Kelly, Bishop Museum, Personal Communication)

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